

Claims:

1. A method for passivating stainless steel after acid pickling treatment in the absence of nitric acid, the method comprising the steps of:

 cleaning the pickled stainless steel with an alkaline composition to obtain cleaned steel;

 activating the cleaned steel with an activator composition to obtain activated steel, the activator composition containing at least one activator, the activator having a significantly higher binding affinity for iron than for chromium; and

 passivating the activated steel with a passivating composition in the absence of nitric acid.
2. The method of claim 1, wherein the activator is an organic chelating compound.
3. The method of claim 2, wherein the activator is a carboxylic acid.
4. The method of claim 3, wherein the activator is one of oxalic acid, tartaric acid, gluconic acid, citric acid, malic acid, and mixtures thereof.
5. The method of claim 4, wherein the activator is present in the activator composition in an amount from about 5 g/L to about 25 g/L.
6. The method of claim 5, wherein the activator is present in the activator composition in an amount of about 20 g/L.
7. The method of claim 3, wherein the activator composition has a pH of at least 10.
8. The method of claim 7, wherein the activator composition has a pH between 10 to about 11.
9. The method of claim 1, wherein the activator is inorganic.
10. The method of claim 9, wherein the activator includes fluoride.

11. The method of claim 10, wherein the activator is fluoride.
12. The method of claim 11, wherein the activator composition further includes phosphoric acid.
13. The method of claim 11, wherein the activator is present in the activator composition in an amount from about 5 g/L to about 15 g/L.
14. The method of claim 13, wherein the activator is present in the activator composition in an amount of about 10 g/L.
15. The method of claim 11, wherein the activator composition has a pH between about 1.5 and about 3.
16. The method of claim 11, wherein the activator composition has a pH of about 2.5.
17. The method of claim 10, wherein the activator composition further includes an organic acid.
18. The method of claim 17, wherein the organic acid is oxalic acid.
19. The method of claim 1, wherein the passivating composition has a pH of about 2 and contains phosphoric acid, fluoride, iron and hydrogen peroxide.
20. The method of claim 1, wherein the passivating composition includes molybdenum.
21. The method of claim 20, wherein the activator is an organic chelator compound.
22. The method of claim 21, wherein the activator is a carboxylic acid.
23. The method of claim 22, wherein the activator is one of oxalic acid, tartaric acid, gluconic acid, citric acid and malic acid.
24. The method of claim 23, wherein the activator is present in the activator composition in an amount from about 5g/L to about 25g/L.

25. The method of claim 24, wherein the activator is present in the activator composition in an amount of about 20 g/L.

26. The method of claim 22, wherein the activator composition has a pH of at least 10.

27. The method of claim 26, wherein the activator composition has a pH between 10 to about 11.

28. The method of claim 20, wherein the activator is inorganic.

29. The method of claim 20, wherein the activator is fluoride.

30. The method of claim 29, wherein the activator composition further includes phosphoric acid.

31. The method of claim 29, wherein the activator is present in the activator composition in an amount from about 5 g/L to about 15 g/L.

32. The method of claim 31, wherein the activator is present in the activator composition in an amount of about 10 g/L.

33. The method of claim 29, wherein the activator composition has a pH between about 1.5 and about 3.

34. The method of claim 33, wherein the activator composition has a pH of about 2.5.

35. The method of claim 20, wherein the activator composition further includes an organic acid.

36. The method of claim 35, wherein the organic acid is oxalic acid.

37. The method of claim 20, wherein the passivating solution has a pH of about 2 and contains phosphoric acid, fluoride, iron and hydrogen peroxide.

38. The method of claim 1, wherein the activator has higher complex formation constants for iron than for chromium.

39. A method for pickling and passivating steel, the method comprising the steps of:

pickling the steel by contacting the steel with a non-nitric acid based pickling treatment to produce pickled steel;

cleaning the pickled steel with an alkaline cleaning solution to obtain cleaned steel;

activating the cleaned steel with an activator composition to obtain activated steel, the activator composition containing at least one activator; and

passivating the activated steel by contacting the activated steel with a non-nitric acid based passivating composition.

40. The method of claim 39, wherein the steel is stainless steel.

41. The method of claim 39, wherein the activator has a high binding affinity for iron.

42. The method of claim 41, wherein the activator has a low binding affinity for chromium.

43. The method of claim 39, wherein the passivating composition includes molybdenum.